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AUTHOR Nystrom, Dennis; And Others
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ABSTRACT

Selected technological and research areas that may affect emerging careers and work expectations were discussed in the five seminar presentations contained in this proceedings. In the introductory section, Dennis Nystrom outlines the goals of the conference and suggests possible implications. Sar Levitan, in the keynote address, examines the relationship between our increased investment in education and the current decline in national productivity. Gerald H. Miller lists selected economic factors which influence career opportunities and also suggests economic conditions that may affect career choices in the 1980's. May Pat Pennell states that the invention of the transistor and the discovery of the structure of the deoxyribonucleic acid molecule are two major breakthroughs in medical technology and discusses the implications of these developments for careers in the health field. Acknowledging the rapid growth of computers and related technologies, Donald Sanders discusses the changing role of the service technicians who install and repair computers, and industrial and business machines. In the final seminar presentation, Edward A. Johnson suggests that major changes have occurred in the way productive work is done and that there is an increasing need to fit people to jobs through education and retraining, rather than fit jobs to people. R. L. Rinehart summarizes the conference proceedings. (DR)

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ECONOMIC AND TECHNOLOGY FORECASTS FOR THE 80'S
IMPLICATIONS FOR CAREERS

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A series of seminars relating to RIT and community colleges
Center for Community/Junior College Relations
Rochester Institute of Technology
May, 1979



Rochester Institute of Technology

1979 "PATTERNS" CONFERENCE PROCEEDINGS

Institute College
Career Information Graduate Studies

One Lomb Memorial Drive
Rochester, New York 14623
716-475-2001

Topic:

Economic & Technogy/Research Forecasts for the '80's; Implication for Careers & Planning

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the Center

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HUMAN RESOURCES DEVELOPMENT:
TRENDS AND IMPLICATIONS FOR THIS CONFERENCE
BY
DR. DENNIS NYSTROM
DEAN OF THE DIVISION OF CAREER EDUCATION
ROCHESTER INSTITUTE OF TECHNOLOGY

I was very pleased when Dr. Rinehart asked if I would spend a few minutes at the beginning of the Conference to kind of "set the stage" so to speak. I am afraid that I will be very hard pressed to do this as I look over the list of presentors and discussion leaders. From Sar Levitan, our first and keynote speaker later this morning, through Dr. Cheng our conference leader for the last formal session tomorrow, each individual brings a tremendous wealth of education, experience, and concern to the basic issue at hand... The implications of economics, technology and research on careers in the decade of the 80's.

I would like to do this by reviewing the conference goals.

Goal #1 -

To interpret alternative economic forecasts and factors in terms of labor and manpower needs for short-term and intermediate term planning.

First, there can be little question regarding the existence of a very close relationship between the national and international economic condition and career opportunities for all manner of people. However, economics can be expressed in a wide variety of ways. Oh, we all discuss "inflation", "recession", and "dollar value exchange rates". But, we often overlook some of the apparently "less significant economic factors that have dramatic effects on national and international career development.

For example:

1. What about the economics of individual productivity? The U.S. used to be #1 in the world in individual productivity growth rate. Today we are ninth behind nearly every other industrial nation in the world. What does this mean to future career opportunities? What does it mean for future industry/education collaborative efforts?
2. How much capital is being invested in new facilities and equipment in American business? Has it become a matter of poor economics to invest in ourselves? Without investment in modern equipment and facilities, individual productivity will not increase, and inflation will continue to grow.
3. Are we truly involved in a "world economic system"? Do our students understand this from a conceptual basis? Further, what are we doing to assure that this knowledge can be practically applied to personal life and career decisions?

Goal #2 -

To explore and analyze selected technological/research areas that have a potential for affecting emerging careers and work expectations.

There are many who believe that we are due for a new technological revolution. They say we are living on the tail end of the space program. The one possible exception may be the increasing miniaturization in the electronics field. What does this mean? Continued technological growth and development is essential to the development of new and emerging careers.

Further questions to be considered:

1. Do recent court decisions indicate a general trend toward suppression of large corporation research and development under the auspices of anti-trust legislation? Is there evidence that recent developments by large corporation research units have produced expanded career opportunities.
2. What about the technology of robotics? It is growing rapidly in the auto industry both in the U.S. and Japan. Also, Texas Instruments is a pioneer in the technology. It is not really a new technology but rather a combination of several academic areas including engineering, computer science, and sociology. Does this suggest some relationship between new or evolving technology and careers?
3. Of course, energy and its many elements is receiving considerable attention today. Will enough significant new technology develop or combinations of current technology evolve to cause new career opportunities? I doubt it.
4. Computer applications may be the largest hope for near future opportunity. Later in this conference, several speakers will lead discussions specific to this topic.

Goal #3 -

To compare planning strategies used in different states by industry, education, and government.

Of course, this conference and the formal and informal information sharing that will go on among participants will help assure that this objective is accomplished. Beyond that however, there are some basic questions that should be considered in light of this objective.

They are:

1. Do we in postsecondary education have effective career planning strategies for use in program design for our students, our faculty, others whom we have not yet touched?
2. Do we really want accurate/current data for such planning? Is it available through existing agencies and groups?
3. How are we monitoring output of college and university programs on a regional and national basis?
4. Much of business and industry for sometime now has used various forms of succession planning. What is the role of postsecondary education in this planning and the implementation of the plans? Does education do its own succession planning?
5. Do we really have an effective linkage between Education and Work? Regional councils do their part on a macro basis. Cooperative education or internships do their part regarding new skills and talents entering the labor pool. However, many believe an entirely new order of institutional relationships must develop to
 - a) reach populations in the work force who have not as yet been reached
 - b) provide thorough research/consultant/service support to the business/industry sector
 - c) assure a free exchange of professional personnel and postsecondary faculty.

This leads to the next conference objective.

Goal #4 -

To share concerns, ideas, and information between industry, business and education so that effective collaboration can be facilitated and to encourage increased communication and cooperation.

1. Mid-career crisis, or the result of some phenomena that has gone by that term, is extremely costly to every sector of the economy. Could it be that closer collaboration, i.e., faculty/staff sharing, multiple career planning counseling services, special intervention programs "at work" educational access, etc. might help here.
2. Why does a recent DOL supported survey indicate that college graduates are the general group who has the greatest increase in job dissatisfaction??? Doesn't this mean that education/industry should be working together in new and unimagative ways to solve these problems?

May 1 issue of the Wall Street Journal

Job Tenure 3.6 years per job 1978

from

3.9 years in 1973

men = 4.5 years

women = 2.0 years

Goal #5 -

To review social political, and/or demographic projections that are needed to interpret the economic and technological forecasts.

It is difficult to follow social and political trends with any real degree of certainty. However there are some questions about demographics that are in need of answering.

1. New York is sure to lose several seats in U.S. Congress because of population decline. Where is this population going?
 2. What about the sun belt and frost belt migration? Is it happening? Will it continue? What kinds of people are migrating? Is there return data as yet?
- Who's moving? Where? When (age)?

THE DOUBTFUL LINK BETWEEN PRODUCTIVITY AND EDUCATION

Rochester Institute of Technology
Conference on Economic and Technology Forecasts
Rochester, New York
May 10, 1979

by

Sar A. Levitan
Center for Social Policy Studies
The George Washington University

My assignment today is to outline what I view as the questionable link between education and productivity. When I was told that there would be some 30 college presidents here, I felt as if I were going to preach atheism in the Vatican or capitalism to the Moscow Institute of Economics. But, having committed myself to this subject, I'll stick with it because I'm a tenured college professor. As you college presidents know, tenured college professors have a safety net and, in theory, they can't be thrown to the floor.

To talk about the doubtful links between education and productivity, I need only point out that a firm correlation hasn't been established in our advanced stage of an over-educated workforce. There are serious problems in measuring productivity rates for many jobs in the American economy, and I suspect that the specialists who design productivity movements tend to assign an inflated value to the impact of education or, as they call, it investment in human capital, upon productivity. If productivity were measured by teamsters or coal miners, I wonder whether they would have assigned as much value to education as a factor in increasing productivity as the college professors who did designate the productivity measures we use. Other factors besides education may have produced the result, and we can't assume that formal education -- or longer education -- was the Godsend.

Productivity problems are serious and they have a major impact on the economy. Output per workhour in the United States has not increased at its historic rate in recent years. During the first two decades following World War II, starting with 1948, total factor productivity increased at the rate of 2.9 percent. It increased at half that rate during the past decade. And if you look at the first quarter of 1979, the picture is really bleak. There was actually a decline in productivity. Yes, there is plenty to be concerned about.

Does that have anything to do with education, or was it caused by other factors? As we all know, our nation kept on investing more and more in education, and productivity is declining. Hence, unless you want to make a case that there is a reverse relationship -- that the more we invest in education, the less productivity grows, which I would not make -- then, of course, the thesis of a doubtful link between education and productivity can have some merits even for educators.

Why the Slower Growth?

Why is the productivity growth rate declining in the United States? The reasons are very clear. First of all, during the 1970s, we have largely experienced loose labor markets, slow growth and even declines in our gross national product. In loose labor markets, with the surplus of workers, productivity either declines or grows very slowly. And if some social thinker tells you that 5.8 percent unemployment is full employment, I would like to know what he or she is smoking, because that is not full employment. Maybe we can't reach 4 percent unemployment in the short run, but 4.8 percent is a loose market and calls for social policies to cure labor market pathologies. The link between business cycles and productivity has been established.

Another factor causing slow productivity gains has been the types of industries that have grown at a rapid pace since World War II -- service industries. It is far easier to boost productivity in the industrial sectors of the economy than in the service industries. A good example of this can be seen in a college. We may want to process 40 cars per hour on the assembly line instead of 20. But do we also want to crowd 40 students, instead of 20, in a class? Is increasing the student-teacher ratio a good thing even though it would reduce costs per unit and presumably productivity rates? If you go into a hospital and you need an appendix removed, would you want your surgeon to place you on an assembly line in order to increase productivity? An increasing proportion of our total economy and labor market is made up of service industries. Given this fact, one would expect slower productivity growth. But we must remember that we are still a very affluent nation, and we are still a very highly productive economy. And the reason why we want better services, better schools, hospitals and universities is because we can afford them. Fashionable Jeremiahs notwithstanding, America is still a very rich and productive country.

A third factor behind productivity problems is that we want not only increased productivity per worker, but we also want clean air and water. Also, we want that worker to have a safe, healthy and pleasant work environment. All this costs money and requires more capital to produce the same tons of steel or tons of coal per worker. Of course, from a statistical point of view, the private productivity of the steel mill or coal mine will not grow as fast. But from a social point of view, has real productivity fallen? We now not only have the metal or the coal, but we also have safer air and clearer

water and fewer work related health and safety problems. The official numbers only look at private productivity, and I suggest that it is social productivity that really matters.

A fourth factor behind the productivity track record is a less experienced labor force. After World War II, we decided to have lots of kids, about 4.2 million annually through the 1950s and early 1960s. They started to enter the labor force in record numbers during the mid-1960s. In addition, as females started to have fewer kids, and as the technology of the kitchen and the bedroom has changed, we could have more females in the labor force. I'm not saying that females are less productive or that they necessarily decreased the productivity of the workforce. But the turnover rate for females -- while they are behaving increasingly more like men in the labor market -- is higher. This is true particularly if you deal with females of the childrearing age. Higher turnover rates for both females and young workers do tend to reduce productivity.

There is another factor that will be controversial, but I hope you will take it in the right spirit. About 15 years ago, we decided to move in the direction of equal employment opportunities for females and minorities. In itself, this reduces productivity. Until the workplace, be it college or factory, becomes acclimated to the new rules of the game, the employment shift can hurt total productivity. A non-minority individual may have a higher productivity level, but equal employment factors may block his or her chances. But this is a price I for one am willing to pay to improve social equity. Again, it's not a permanent change. Once we get adjusted to these changes, there should be no decrease, and we may even possibly see improvements. It is naive to think that equal employment will be a costless goal for society. But the long run benefits far outweigh the costs.

I like Eric Hoffer's phrase: "the ordeal of change." We are undergoing the ordeal of change, and these changes are wrenching society. But at the same time, we're making a better society -- at least by my standards. We must expect that there will be some impact on productivity growth levels. There is no free lunch as we economists keep telling you.

Discipline?

The changes I alluded to and other transformations that society is undergoing have resulted in a less disciplined workforce. Demographic forces have given us more young workers who tend to be less disciplined. But part of it is also due to the affluence of our society. The rules of the game have changed and we now have a different society as far as income support is concerned. In my lifetime -- and in the lifetime of most of you here -- there was once upon a time in these United States when people either worked or starved. That is no longer the case. I'm not talking about welfare or AFDC because that's a small part of transfer payments -- the economist's polite term for paying people for not working or because they worked in the past. Total transfer payments now surpass \$230 billion per year, and they are rising. That's a big bundle of money even in inflationary days.

To put it differently, nearly one-sixth of our total disposable income comes from transfer payments. The federal social security system now supports some 34 million people, and private pensions as well as disability insurance enable many workers to retire at younger ages. In the federal government, an employee can retire at age 55 with 30 years' service -- and lots of people do that. Also, unemployment insurance has taken some of the sting out of being without a job. At the same time, almost 60 percent of

American families have more than one wage earner. Again, this reduces some of the sting of job loss.

You know the very well known story about the auto worker who was berated by his foreman: "What's the matter, Jim? You're an excellent worker. Why don't you come in on Friday?" And the worker said very simply: "Because, damn it, the company doesn't pay me enough to take off also Thursday." The point of all this is that transfer payments, a working wife (or husband), and private fringe benefits produce many good things for society. But all these changes have had a side effect of reducing the discipline of the workforce. This makes productivity growth harder to sustain. This fear -- and I hate to use the word "fear" -- but the old-time discipline that was in the marketplace does not exist. Productivity experts don't talk about this phenomenon because we don't know how to quantify it. The reason I'm making a lot out of this is because I suspect that it is a very important factor in the smaller productivity growth rates the American economy experienced during the past decade.

A final factor has been the vast migration from the farm to the factory since World War II. What this means is that in the agricultural sector, fewer and fewer people produced more and more. If you take the historical view, a century ago half the population was producing the food and fiber of society. Currently, less than 4 percent of the labor force is in agriculture, and we can't go much below that. Therefore, productivity in agriculture is not going to continue to increase as it did.

What about the Future?

Will these poor productivity trends continue forever and ever? The answer is no. The decline we have suffered does not have to continue. I think we'll settle down and adjust to the ordeal of change. That in itself

will increase productivity. Also, demographic forces are going to be in favor of increasing productivity. Lower birthrates mean that fewer young workers will be entering the labor force and experienced workers will make up a large fraction of the workforce. I think we are going to induce more people to stay longer in the workforce. We will need them, and we simply won't be able to afford to support more and more people while fewer people are working. All this in the future will tend to increase productivity. I don't know by how much -- whether that's going to raise it back to 2 percent a year or 2.9 percent. But it would be wrong to think that today's conditions will continue.

Also, before we start feeling too sorry for ourselves, we should ask: Is it really so bad that productivity has slowed down? Our society wants more services, clean air and water, safe workplaces, equal employment, income transfer, and the list goes on and on. Nor are we alone in our wants. As other countries grow in wealth, they seem to desire many of the same things. Only as a country becomes richer can it think of spending scarce resources for these goods and services. This seems to be part of the economic development process, and we should have expected it.

Looking Behind the Statistics

When we compare data from two countries, it is important to look behind the numbers. For example, the head of the Political Economy Department of the Moscow State University -- which is their Harvard -- came by my office last week because he wanted to find out a little bit about the labor force statistics. In Russia, productivity is growing, but the figures are not reliable. Yet it seems that their productivity growth rate may be larger than ours. But about 35 percent of their labor force is in agriculture, and

some experts suspect that it may be even higher. In other words, they are where we were -- as far as the distribution in labor force -- more than fifty years ago. They have not gone through this stage of development. So international comparisons are not too useful and are frequently misleading. If both the U.S.A. and the U.S.S.R. were in the same development stage then quick comparisons might mean more.

Also, remember that we won World War II and Berlin was bombed -- not Rochester or New York. In rebuilding bombed plants and expanding their industrial base, many countries invested in the most modern high productivity equipment. The U.S.A. was left with many older plants, and we have had to wait for the slower forces of depreciation instead of war.

We did a very good job of destroying Germany. I was there last year and I've talked to the people in the Ruhr Valley. By now, it's completely rebuilt with entirely new factories. During the first decade after World War II -- while we were having our babies -- Germany was rebuilding its cities. Once they started to rebuild their cities and homes, they started to have babies in the late 1950s and 1960s. Right now, Germany is doing exactly what America did when we didn't know what to do with the growing number of children. We started to give them what is euphemistically called "higher education" but is really longer education. Germany is doing the same thing now. Instead of having compulsory education until age 15, they are making it 16 and before long, they are going to have longer and longer education.

Also, in Germany, France or England, the labor force has not grown at all. Germany has as many jobs today as it did five or six years ago. What happened? The Germans took in some "guest" laborers. When the Germans didn't need the "guests," they sent them back to Turkey, Greece and Yugoslavia, sometimes with generous severance pay. What did we do? During the last few

years, we kept on increasing our labor force by several million people, while the other nations have not created new jobs. In addition to that, we also absorbed undocumented aliens, or in plain words, illegal immigrants, to whom we give jobs for one reason or another. Sometimes we don't count them. Again in comparing our situation with other nations, let's not feel too sorry for ourselves.

Education's Impact

What implications does all this have for education? We invested 0.7 percent of our GNP in higher education in 1950. By 1960, we almost doubled the share to 1.3 percent. By 1970, we almost doubled it again to 2.5 percent. And we have stayed around the 2.5 percent of total GNP for higher education.

We have gotten a great deal for this investment in education. As I said, we got the kids out of the way. Educational institutions are a proven aging vat. We send the kid off to college; he or she reads a little bit of Shakespeare; learns some spelling; and sometimes takes economics. Generally, by the time the young adults leave school at the age of 21 or 22, they are ready to start honestly working. This is an investment that paid off. But the question arises: Can we continue with this kind of longer and longer education? As you know, we now have some 11 million people in post-secondary education. A million of them are in graduate schools.

What did we essentially do with these kids since World War II? We kept on playing games. We created what we call "college required" jobs. Why did we do that? Because we had to create jobs for our kids and for our wives and girlfriends. And then if we gave them an education, we created

"an objective criterion" for giving them the better jobs. We didn't discriminate, but we decreed that some jobs would require a B.A. -- I would not say B.S. in this connection. And we had our job specialists write up the jobs, and they made it official by branding an increasing proportion of jobs as requiring college degrees. Therefore, we must keep on allocating the better jobs for the college graduate. For most jobs in the United States a high school education was enough before World War II. Can we continue to allocate the jobs on that basis and generate enough jobs for college graduates? There is something to supply and demand. If a larger proportion of the population is going to get a college education, then the supply is going to increase. What's going to happen to demand? We really don't know, and we have to speculate. BLS estimates that between 1972 and 1980, we will have created some 8.8 million college required jobs, enough to match the supply of roughly a million college graduates a year. This more or less created an equilibrium with supply. But BLS projects that in the first half of the 1980s, college required job openings will amount to 5.7 million while the supply of college graduates will be 6.4 million. The point is that the chances are that the supply of college graduates will be greater than the demand.

What does that mean as far as the community colleges and the junior colleges? We are far away from California, but the spirit of Proposition 13 is strong in this land. I don't believe that we are going to allocate more and more funds in every state to create additional state colleges and universities. But, I think that the fat years are over, and the lean years are upon us. In this type of situation, we can't expect that the taxpayer is going to continue expanding support for colleges with ever increasing funds. The easy answers would be that we need vocational education more now

than ever before. Technology is not getting any simpler. Therefore, the answer is junior colleges at first glance. But that would be assuming that what we want for our kids is a junior college or an A.A. degree, and we will settle for that. We know very well that most of us want at least a B.A. for our kids -- or an M.A., if not even beyond that.

That means that colleges do have a very real future -- except that the future contains more of a vocational orientation than Shakespeare or calculus. That is a possibility. I think sometimes of Webster College in Michigan as the wave of the future. If the thing is to give kids a B.A., universities could give them a B.A. in auto-repair or maintenance of office and home appliances.

Who Will be Educated?

Another possibility is that we have to change the college clientele. It's obvious that we're not going to have as many 18 to 22 year olds in the 1980s, because they were not born in the 1960s. The decline in the birthrate started in 1963 and until last year, it was continuous. Next year, we will have less 16 year olds than we had last year. If we are not going to get the kids for our colleges, do we have other groups to draw on? I think we have the other potential clients, but that means a complete reorientation of the community colleges. In my own university which is a metropolitan college, we started a weekend M.A. program a few years ago. We have in Washington a large supply of professionals who want to get an M.A. in human resources. It was a revolution in my university to arrange a weekend graduate program. But these people have jobs; they have wives; they have husbands; they have kids, and their only free time is during weekends. It requires a reorientation

in the way we teach. The professor can't treat the 30 or 40 year old in the same way as a 19 year old student. The community colleges are in good shape to handle different types of students including people in mid-career. The location is right. They are not away someplace in the fields with the cows and the flowers. They are where the people are and where the people are who need them.

The changes that we have experienced in the last 12 or 15 years have been wrenching. Productivity levels have been affected because society has changed. Yet while it may be a changing, our society remains stable. We are not going under -- despite a decline in productivity. The 1960s were rough in a social sense and the 1970s have been rough in an economic sense.

We have a strong, stable and prosperous society. And in this environment, the junior colleges and the community colleges will have a very significant role to play. But, again, it means adapting to change. And change is difficult. But we'll adjust to it, I'm sure.

ECONOMIC FACTORS AFFECTING CAREERS

PRESENTATION BY DR. GERALD H. MILLER

MAY 10, 1979

I appreciate the opportunity to be with you, and I am convinced that more planning sessions of this nature are in order. It is evident that postsecondary enrollment experts predict a downward trend nationally through the year 2000. This trend has already begun in the State of Michigan. Four year and two year enrollments are expected to decline by 16,000 FYES ending FY80 and 45,000 by 1990. I believe that we will come to call this the "Decade of Declining Enrollments." This situation, when combined with economic uncertainties, makes it imperative that college boards, administrators, faculties, and communities begin to plan: NOW! If we fail to do so, the consequences may be disastrous for some institutions.

I would like to divide my presentation into three parts.

- I. Selected economic factors which influence career opportunities
- II. Forecasting those economic conditions expected to have the greatest impact on career opportunities during the "80's"
- III. Admonitions to college representatives

The following list of economic factors is not complete - but is representative of those most common and influential. Economic factors seldom function alone - but generally act in relationship to one or more variables. (Example: Employment is high during wartime.)

Selected economic factors which influence career choices in brief outline are:

1. Wartime vs peace time
 - A. Skill levels, types of jobs, national planning required
2. Federal, state and local spending policies
 - A. Impact of fiscal restrictions: proposition 13, proposition E
 - B. Inflexible \$ (corrections, medicaid, mental health vs flexible
3. Federal/state regulations on Industry
 - A. Pollution controls - retrofitting existing plants
 - B. OSHA
 - C. Affirmative action
 - D. Trade and commerce regulations - also protectionist import laws
4. Federal fiscal policies
 - A. Interest levels
 - B. Tax shifts
 - C. Mandatory wage and price controls/voluntary
5. Ratio of public sector spending to GNP
 - A. Growth in percentages over last 10-21 years
6. Inflationary levels
 - A. Business climate in general
 - B. Recession cycle - budget stabilization
7. Employment vs unemployment
 - A. What are acceptable levels
 - B. Full employment bill at federal level
8. Demand for durable goods
 - A. Creates jobs as demand increases

9. Industrial capital expansion/retrrenchment
 - A. Automation, reduction in workers
 - B. Small business failure
 - C. New technologies
10. Balance of trade
 - A. Jobs lost to foreign products
 - B. Exports
11. Work force size/mix/geography
 - A. Number of people in age groups competing for jobs
 - B. Mandatory retirement
 - C. Migration patterns
12. Housing/construction
 - A. Cost of materials
 - B. Availability of materials
 - C. Interest rates
 - D. Availability of loan money
13. Worker contracts to be settled
 - A. UAW - potential impact
14. Federal programs
 - A. Energy research
 - B. Building dams
 - C. Capitation grants in health fields
15. Birth rates
 - A. Declining - upturn expected through 80's
 - B. Demand for teachers reduced

Now, I would like to turn your attention to forecasting those economic conditions expected to have the greatest impact on career opportunities during the '80's". There are five key variables that I would like to outline as I feel they will significantly impact on career choices during the next decade:

1. Federal/state and local spending policies

A. Drive for balanced budgets

B. Inflexible expenditures (corrections, mental health) vs flexible (stimulation)

C. Purchase of goods and services by federal government - increase 1.8% per year

1. Increasing defense purchases expected to rise 1.5% per year in real terms. Defense employment will decline

2. Nondefense purchases - 2.4% annual increase. Nondefense employment - 2.5% increase. Wage rates 7% increase per year

3. Increase in Governmental jobs - 1974 - 1985

Federal	3%
State	28%
Local	41%

2. Size, mix, and geography of labor force

A. Labor force growth - will decelerate sharply after 1980, (Reason: Birthrate decline during 60's)

B. Smaller number of workers aged 16-24 - expected to decline by 6 million 1980 to 1990

C. Larger work force age 25-54

1. Women - dramatic increase - 11 million

D. Median age of labor force

39.6 years - 1970

35.5 years - 1975

34.7 years - 1980

Upward swing in median age beyond 1980's

E. 1980's growth concentration - 35 to 44 years

1. Productivity expected to increase
2. Crowding of workers in central age group
3. Greater competition for certain jobs: Particularly junior management levels

3. Federal Fiscal Policies

A. Social security tax increases - maximum income base increase 10.5% per year to \$42,500 by 1987

B. Budget deficit

1. Expected to return to balance - after 1985
2. Rate of decline - \$7 billion per year after 1980
3. Impact on job market

C. Monetary policy

1. Neutral posture - base increase 7.3% per year relative to a 9.1% rate increase in current-dollar GNP

D. Foreign trade sector

1. Wholesale price index for 12 major industrialized countries
8% increase per year
2. Industrial production index - 5% per year

4. Employment by occupational category

A. By occupation

	<u>1980</u>	<u>1987</u>	<u>% Change</u>
1. Manufacturing	19.86M	21.07M	6.1
2. Construction	4.18	5.52	32.9
3. Services	16.65	21.12	26.9
4. Trade	20.31	25.29	24.5
5. Regulated industries	9.66	11.01	14.0
6. Mining	.95	1.09	14.7
7. Civilian government	<u>15.63</u>	<u>18.93</u>	<u>21.1</u>
Total Employment	87.23	104.02	19.3

B. By type of position held - 1974 to 1985

	<u>% Change</u>
1. White Collar	19%
A. Professional/technical	20%
B. Managerial	14%
C. Sales	9%
D. Clerical	24%
2. Blue Collar	6%
A. Craftsmen	9%
B. Operator/assembly	4%
C. Auto operator assembly	4%
D. Other non farm	4%
3. Service	27%

5. Wartime vs peacetime

- A. Declining veterans enrollments - 45,000 to 23,000 in Michigan colleges and universities
- B. Ratio of men to women competing for jobs is increasing in favor of women
- C. Possible reinstatement of mandatory draft

Conclusions

1. Women entering all aspects of the work force will play an increasing role in influencing available career choices
2. The age group 25-54 will experience the greatest competition for available job retraining
3. The age group 16-24 will be smaller as a percentage of the total work force. Jobs normally filled by this age group will require more 25-54 age group people
4. Federal government aid given directly to the student will improve "access" opportunities, thereby, increasing the impact of proprietary and vocationally related schools
5. Part time employment will begin to increase at a more rapid rate as unions bargain for "age 55 and out"
6. The greatest opportunity for jobs will be in the professional/technical, managerial, and clerical positions

Most of these positions require some type of post-secondary education.

Michigan program increases since 1974 are:

4-year

Business Management	35%
Computer & Information Science	42%
Engineering	28%
Mechanical & Engineering Technology	36%
Natural Sciences Technology	121%

2-year

Health occupations	39%
Vocational/technical	58%

In conclusion, I would like to share with you several observations -

Admonitions to college representatives

1. Maintain a continuous review of academic programs
2. Don't be afraid to delete costly and unnecessary programs
3. Develop regional articulation with other postsecondary institutions
4. Hire a planning specialist - the cost savings will more than compensate for salary paid
5. Encourage strong and effective leadership from state executive and legislative agencies

Finally, to quote from Jobs For Americans:

"In general terms, the problems are, in part, questions of information, guidance, mobility, and the reduction of barriers to entering occupations and employment. In part, they are questions of improving the qualities and characteristics of both workers and jobs to make the former more productive and the latter more desirable."

ECONOMIC AND TECHNOLOGY/RESEARCH FORECASTS

FOR THE 80's

IMPLICATIONS FOR CAREERS AND PLANNING

BY

MARY PAT PENNELL

There is an old proverb among us natural scientists which says - for an invention or a discovery to take place requires three things - the man, the moment and the method. If any one of these is missing or out of kilter, it will be recorded as an aborted attempt. History is replete with examples of both successes and failures. DaVinci's parachute came before the airplane, Paracelsus on poisons anticipated by a century of antibiotics, pH sensitive glass preceded the galvanometer by 30 years - and on and on with the failures. On the success side, there is Fleming and penicillin just preceding World War II. Military historians tell us that wounds and disease lose wars, not cannons and swords. The space program would not have been possible without the solid-state circuitry that followed the invention of the transistor. Organ transplants have been attempted for over a century - but until immuno-suppressive drugs were discovered, recovery was uncertain at best. And on and on - and so I remind you that, if one of us stands tall, it is because he stands on the shoulders of all those who have gone before. The development of medical technology - no less than other fields - will depend upon the man, the method and the moment.

There have been two major breakthroughs since WW II in the area of Medical Technology. The first, and probably most important because it has spawned more things than we ever dreamed possible, is the invention of the transistor. The

second is the discovery of the structure of the DNA molecule. One can argue that other discoveries or inventions have been important - I agree, but in terms of the sheer magnitude of the importance, I doubt you will find any others of higher lumination.

We are all familiar with where the invention of the transistor has led us. The major emphasis in the beginning was for the communications industry - now, about a quarter of a century later, there are few businesses or industries which do not use solid-state circuitry somewhere in their functions.

It is too early to know where the DNA caper will lead us - but everyone of us is familiar with one of the spin offs - genetic engineering, often referred to as the god syndrome. Of course, we have been doing some genetic engineering for centuries - with our race horses, our milk cows - our chickens, apples, wheat, corn, etc., but now - it appears we can tamper with man himself.

I mention these two discoveries to point out that what happens in medical care and health care in this country and the world is usually dependent upon inventions and discoveries made in another field. We are the great adaptors - very little original or basic research comes from us. If one really wants to predict where medical and health care are going - keep a weathered eye on what our colleagues in engineering and the natural sciences are doing. That will give you a handle on the material aspects.

But that is only half of the picture. The other half is in the expectations of the population we are serving - and for this, keep in close touch with the social policy. It is in this arena that I believe we will see the greatest effect in the 1980's.

Let me explain my rationale for this belief. In 1965 we spent \$39 billion on health and medical care - that's about 5.9% of the GNP. In 1977 we spent \$158 billion of 8 1/2% of the GNP on this same care. Why? Part of the answer is inflation - which accounts for about 50% of the increase - say 10% was due to population increases - leaving a whopping 40% in per capita utilization of health services. Why the increase? Some of the reasons are:

1. Advances in Medical Technology - We have made staggering and costly advances in treating disease and other conditions over the last two decades. The CAT scanner is a good example. A useful tool in some cases, but the cost of one is about 3/4 of a million and a single procedure costs from \$250-400.
2. Increased Demand for Services - Somehow we have conceived the notion that "health care is a right." Just take a look at all the insurance companies covering medical care - the great furor in Congress over national health insurance - "cradle to the grave" coverage. This has put enormous pressures on the health care delivery system.
3. Rising Age of the Population - In NYS we have more people over the age of 65 than the state of Oklahoma has of all ages. The medical care of the elderly is nearly three times that of the rest of the population.
4. Highest Possible Quality - Again, an expectation of the people. "If it's available, by golly, I want it." A few years ago every person with a sniffle went to his doctor - "for a shot of penicillin," and for the most part received that shot. Nowadays we are saddled with a whole raft

of bacteria which are resistant to penicillin. Medicine forgot that living things mutate - and bacteria - many which have a new generation every 20 minutes - mutate a lot faster than anything else we know.

5. Defensive Medicine - As soon as someone realized there was money to be made - the malpractice suits shot up exponentially. Now we "over doctor." Diagnostic tests are often performed "just to be sure".
6. Reimbursement System - The average American thinks health care is "free" or nearly so because the money does not come out of his own pocket. Therefore, he asks for and receives virtually anything he wants. Secondly, hospitals are reimbursed on what they spend. There is no incentive to keep cost down.
7. Low Productivity - Education and medical care rank at the very bottom of efficiency in terms of productivity. I am not sure - considering the nature of the job - we can do anything about it. But it does increase costs.
8. Government Regulations - At present, there are about 2500 rules and regulations and roughly 60 agencies overseeing them. Many institutions have people employed full time just to keep track of the rules.
9. Inflation - Primarily in the 70's, the increase in costs have been due to salaries. Traditionally, health care workers - other than physicians - have been very low paid. Now they are demanding and getting salaries comparable to the workers in other industries. The change in the NLRA has greatly influenced this.

10. Duplication of Services - Far too often the concept of "keeping up with the Jones' " applied to the health care institutions. In Rochester, at last count, we had 5 CAT scanners. We need only one or two. By 1980, we will have about 50,000 excess beds in the U.S. because each hospital wants to be "full-service."
11. Reliance on Acute Care - Because of the reimbursement system, access problems and consumer ignorance, many health problems that could be treated on an out-patient basis are often dealt within the very expensive acute care setting.
12. Numbers and Training of Health Care Professionals - Increased specialization, advanced technology, inadequate or inefficient reimbursement, longer time periods, etc., have increased the cost of education. In the 1950's there were eight recognized health and medical care specialists - today there are over 250. Most of them you never heard of - extracorporeal circulation technician for example. This group came into being with the artificial kidney and open-heart surgery.

If you consider these items - and they are not all the reasons, I am sure - you can easily see that if we do not do something we are headed for two possible endings - chaos or bankruptcy. We cannot continue along the lines we have been without catastrophic results. There are hopeful signs out there. Unfortunately, not many of them are coming from organized medicine nor organized education.

There are joggers by the thousands, small groups everywhere in the U.S. are trying alternative approaches to healing. The health food business is booming - at least some people are becoming aware.

And so - with crystal ball in one hand, I play prophet - with current facts and figures and knowledge of the past in the other, I play prognosticator.

In Biomedical Engineering, I suspect we will see only refinements of the existing technology unless a super breakthrough of the magnitude of the transistor occurs. What new innovations there are are likely to be extremely costly and require a specialist to operate. But someone will have to keep these sophisticated pieces of instrumentation in working order. It seems likely that the Bio-Medical electronic technician and engineer will be in greater demand. I suspect that the federal government will have a hand in the regulation of these new inventions to greater extent. That will mean more manpower - which means more education - which means us.

Nutrition is another area which should grow. There is a growing awareness that, even if we are the richest nation on earth, we rank way down the list in the area of nutrition. Good health is dependent upon good nutrition. Somehow we must re-educate our population to eating right. The emphasis must be placed on the preventive end - not curative.

With those technicians, technologists, therapists, nurses, etc., whose home base is the acute care institution, the growth will probably be no more than population growth. We will always need the acute care facility and consequently need for staff. Where programs already exist in medical technology, radiology, nursing,

medical records, etc., the manpower needs are probably being met. However, if new industry is moving into an area which attracts a larger labor market, you can expect the demand for acute care specialists to increase. Where industry is leaving the demand will no doubt decrease. The 1980 census will be important in our planning.

My observation is that the government is already taking steps to curtail growth in this area. As most of you know, there were no funds allocated thru HEW's Health Resources Administration for Allied Health Special Improvement grants and the Nursing Capitation funds were cut. Because of the high cost of educating these health professionals, most of us are dependent on outside funding for expansion - and often, for improvement. I believe that more and more the cost of this education will be borne by the community it serves.

The only new direction I see for these professions is in the area of computer science. To the extent possible, this should be worked into every curriculum. There are other speakers at this conference who will address this area.

But the area we should be working in is prevention of health problems and the maintenance of a healthy population. There was a time - just a few years ago - when education was leader for change. It is high time we reasserted ourselves - this area is wide open. Somehow, we must re-educate our citizens to their responsibilities for their own health. We simply cannot afford to continue our dependence upon the system which is not working and is too costly.

Recognizing that citizen responsibility is a necessary part of health maintenance, the President of MCC, Dr. Koch, appointed a task force of the most talented

faculty we have to study the issues and make recommendations for future curricula developments. The task force covers 12 different disciplines - health education, psychology, sociology, anthropology, biology, chemistry, geology, human services, dietetics, nursing, dental hygiene and physical education. They are working in two broad categories - personal health and population health. The first will deal with nutrition, mental attitudes and physical exercise as general topics - and the second will explore the areas of public health, environmental engineering, environmental awareness programs, political issues relating to the public health, sociological and cultural impacts of changes in populations, their expectations and the limits to satisfying those expectations.

We are beginning to put our emphasis on Education for Health. It is a broad approach covering many disciplines and integrating them into whole cloth. To this end, we have established a program in Community Health. It is designed as a solid Liberal Arts degree which will transfer into upper division colleges. Such courses as Fundamentals of Health, Community and World Health Issues, Consumer Health, Urban Sociology, Developmental Psychology, Chemistry and Economics make up the core with electives from those on the prevention of debilitating disease and the maintenance of health. And, we will continue to do so.

1979 "PATTERNS CONFERENCE SPEECH
THE CHANGING ROLE OF THE SERVICE TECHNICIAN
BY
DONALD SANDERS

Good Morning. I have the opportunity to talk to you today about a subject that is of major importance to me and should relate directly to some of the plans that you formulate as a result of this conference -- the changing role of the service technician.

To make certain we are all thinking of the same kind of service technician I will define the technician as used in the presentation today. There are about 70,000 persons who still make "house calls" when someone says they have a problem. A simple telephone call will usually get a fast response. And in usually less than two hours the ailing equipment will be in the hands of expert care. I am referring to the service technician who regularly makes calls on customer's premises to service a wide range of computer and business equipment products; products like word processing machines, office copiers, check sorters, and some quite far afield, such as, clinical laboratory instruments in hospitals and doctor's offices. I would like to make a distinction between these people and household goods service technicians. That distinction is in the educational requirements required for entrance into the job markets.

The average household appliance service technician, the people who repair radio and television sets, etc. generally do not have any exposure to college. In fact, most have received their basic technical education through an experience with the armed forces. This contrasts with service technicians who are employed by larger industrial manufacturers to service computers, industrial and business equipment. In the later case, most service technicians must have at least an associates degree to be considered for employment. If not an associates degree, some formal training by one of the many technical education institutions.

Now that the educational background and the scope of the job have been established, I will describe a major technological change impacting on this group of service technicians.

The fantastic progress in computer technology and electronics technology has exposed some brand new horizons to us that were not even visible five years ago. For instance, if the automobile industry had made the same progress in the past 20 years as has the computer industry and would be able to buy a Rolls-Royce for \$250 and the EPA sticker in the window would promise one million miles to the gallon, 2 years double, 1/2 price. The age of product intelligence is here now.

Milton-Bradley, the toy maker, predicts that this year the electronic game business will be a one-half billion dollar a year business -- a business that two years ago did not exist. In fact, in the next few years it will be difficult to imagine the device that will not have the word "intelligent" associated with it. The impact of the microprocessor, microcomputer if you will, upon all of our lives will be enormous.

Perhaps no better summation exists than in "Business Week", March 10, 1979: "No single invention is so radically changing U.S. industry today as is the microprocessor. So powerful is this semiconduction device that it is rewriting the economics of computing, and stretching the imagination of equipment designers in many industries. Already, some thoughtful observers refer to the microprocessor as the engine that is powering a second industrial revolution - one in which man's brainpower will be multiplied with even greater force than the steam engine multiplied his 'muscle power'. With computer-type technology available through the microprocessor to virtually all industrial manufacturers, competition on price, benefits and customer features is becoming a reality over a much broader base of suppliers; and in our opinion, the competition for customer satisfaction with the use of a product will become a more influential element in the buying process.

The job of the service technician to keep equipment running has always been an important one. But in the future, service will become more important than ever before - to suppliers as well as their customers. If you don't integrate service into the sales presentation, customers ask about it. More and more it's the clincher in the deal.

So you say, the service technician's role is of increasing importance. That is a very positive change in that person's role from the past, but not a very unsettling change. If that were all that statement would be correct. Let's examine this person's present technological role to see that impact microprocessors will have on the basic skills a technician brings into the job.

Most kinds of equipment, with the exception of computers themselves, are composed of substantial numbers of mechanical components in addition to the electrical ones. This mix required tactile skills for the technician. In the past the least reliable part of an equipment system was generally the mechanical. There was greater utilization of tactile skills than the knowledge and skill concerning electrical troubleshooting. He could see, visualize - logic. Diagnostic insight not required. Even the repair of electrical components utilized tactile skills to remove and solder in replacement parts.

With the advent of the microprocessor, the mechanical electronic component mix is changing. More and more mechanical tasks are being replaced in equipment by the microprocessor. For example, timing cams and gears, levers which controlled sequence of operations and mechanically activated switches have all but disappeared as the tasks those components performed have now been taken over by the efficient management of the microprocessor. The microprocessor can keep track of hundreds, or thousands of little details as the operational cycle of equipment continues and send out commands to modify operation to meet certain criteria. Even the mechanical components remaining operate with greater reliability because of the microprocessor management.

The net result is more reliable equipment on a component to component basis. However, because many more features can now be incorporated in equipment in the same space, and frequently for less money, the overall complexity of equipment is increasing.

To use an outdated colloquialism, let me change gears for a moment, and tell you about what we see as the demand for technicians in the future. If you go by Department of Labor statistics, the forecast for the next ten year period is an industry demand of 70,000 new technician jobs in the United States. However, that prediction is made only for technicians supporting large scaled computers on customer's premises. It does not include other industrial products sold to customers that will have microprocessors incorporated in the design, nor does it include the thousands of technicians that are employed inside plants by manufacturer's. By just about anybody's guess, we are heading for a serious shortage of entrance level technicians trained with the skills required in the mid-1980's.

Just in the computer and business equipment field by 1985 the industry expects a shortage of 30,000 people with the right kind of training for jobs that will be waiting. No one, for instance, expected the pocket calculator or the electronic toy businesses to expand so rapidly or to the level they have. It is very difficult to predict the extent to which the microprocessor will affect some products under development now. These will all be added to the competition in the job market that will exist for those people with the right kind of skills. Not just the traditional manufacturers of computers and business equipment will be competing amongst themselves. The wide spread application of the microprocessor into all kinds of products will generate enormous interest in industries that heretofore have not considered people with associate degrees. Of course, many industries will try to fill the gap with in-house training; they have to for those already on the payroll to bring them up to the current state of the art.

But to do that for new hires, those people coming into the market place with insufficient skills, is barely conceivable now. This is because of the effects of chronic inflation on a very labor intensive activity. One of the service management's major problems of today is how to keep the cost of service to a reasonable percentage of the original cost of the equipment. Total company training would become unmanageable.

In short, the major issues affecting the role of the service technician of the 1980's are increasing competition for customer satisfaction with the resulting emphasis on equipment service. A rapidly changing technological base and a shortage of people entering into the labor market with the kind of skills required.

What kind of skills are going to be required? If you examine the future tasks, the most obvious change is in dealing with the microprocessor. Today a technician can expect that when electricity is applied to one end of a wire that electrical voltage will be at the other end -- and conveniently waiting for a test instrument to be connected that will confirm the fact. Tomorrow, or perhaps I should say this afternoon, the technician will be troubleshooting a microprocessor. A microprocessor, the size of your little finger nail, is connected to the rest of a piece of equipment with an umbilical cord called a bus. This bus is bi-directional. That means that signals are passed both to and from the associated equipment - in both directions - and at speeds that to most of us are mind boggling. They are measured in nano-seconds. That is one billionth of one second. So even if you know what you are looking for, and when to look for it, it is no small task to make certain that the signal is the one going the direction you think it should. It is a long way from crystal sets and vacuum tubes. And to complicate matters that bus typically has eight wires instead of the usual two we have been used to seeing at the end of our toasters or razors.

The diagnosis of problems, before you can fix it, becomes infinitely more complex. A microprocessor doesn't do anything without being told to do it. This is done by software, just as in a big mainframe data processing computer. Frequently the software is supplied as preprogrammed memory built into the hardware. It is ironic that software may become the least reliable part of an equipment system.

Now let's go back and reflect on the present technician skill requirements. Diagnostic skills - with pre-microprocessor equipment these have been observing, touching and feeling, for the most part without special instrumentation: A comprehension of the theory of operation, putting into play their prior educational experience. Tactile skills - servicing equipment with a heavy mechanical emphasis, making adjustments, replacing components.

In the future there will be skill requirements to operate the special instrumentation that is used as the eyes and ears of the technician to troubleshoot defective systems network. There will be a diminishing need for tactile skills that have been heavily relied on in the past. In the future the skill of logical problem solving will have to be highly developed. Knowledge of microprocessors, their architecture and functioning will be required. Understanding and being able to communicate with microprocessors through software will also be a very important skill.

But in addition to acquiring state of the art knowledge and skills, those technicians servicing equipment used by customers will have substantial responsibilities in ensuring customer satisfaction in an increasingly sensitive marketplace. As you will recall the real competition will very likely focus on customer satisfac-

tion with service. Skills in communicating and interpersonal relationships will become very important.

It will not be enough to have the technical knowledge about the care and use of equipment, the interpersonal skills to be able to communicate those facts and introduce recommendations to a customer correcting his misuse of equipment while all the while the customer is very likely unhappy about the disruption of his operations caused by a malfunction could very well be the single most important skill brought to the job by the technician. Ensuring customers are satisfied with the service performed is every bit as important as performing the service.

The education of potential service technicians will have to undergo the same kind of transaction as the job, of course. When the educational content does not match the job requirements one obvious thing occurs. The performance on the job does not meet requirements. In due course, however, skills are slowly built on the job and performance does improve. There is another less obvious occurrence also. Unrealistic expectations about the job's requirements in trying to rationalize the educational experience and the job frequently occurs, and in some cases, results in attrition before performance improves.

This is not much of a problem now, but it could be as we proceed into the 1980's, and if it is, it will aggravate the shortage of skilled people by increasing the attrition rates. As one who now occasionally see persons coming to the job market with a preconceived notion of what a particular job is like, only to find that in the real world it is something quite different than they imagined. I for one would like to help avoid the disappointment and trauma that is associated with the realization that it just isn't the same as they learned in school.

To recap then, the world that the service technician is living in is changing, both technically and socially. The change in the technology is also broadening its application and creating additional demands for persons who can service the technology. The supply appears to be falling well below the expected demands. Only through a public education system that remains responsive not only to the changing technology but also to the other job requirements, such as, interpersonal relationships can the industry hope to have a properly trained supply of people. And only through increasing the enrollment of students, both male and female in technician type associate degree programs can the demands of the 80's be met.

I hope this brief description has been of interest to you and my coverage of the subject has intentionally been rather broad brush, and I will be glad to entertain any questions you may have at this time. Thank you.

THE NATURE AND DIRECTION OF WORK IN THE '80'S

by

Edward A. Johnson, Ph.D.

This paper will focus on (1) the nature and quality of work life in present day organizations, and (2) what work life may be like in the 1980's. ¹

POSITION ONE

A number of contemporary academicians and practitioners believe that many workers today have jobs which are designed more for robots than for mature, adult human beings. ² Indeed, these researchers and writers believe that at the present time there is a crisis in the world of work. ³

They believe that a revolution in the way in which productive work is done has taken place in the United States during this century. ⁴ This revolution, they argue, is the result of many factors, including the following: ⁵ (a) the increased reliance of many organizations upon the use of advanced technology and automation; (b) a scientific approach to work design; and (c) significant growth and bureaucratization of many organizations.

As a result of the factors cited above, they claim that work today, at least for many employees, is extremely specialized, standardized, routinized, and under strong managerial and statistical controls. ⁶ Hackman states well the position which is taken by this group.

"The efficiencies of advanced technology, the economics of scale, and the benefits of increased managerial control have generated substantial increases in the productive efficiency of many organizations and substantial economic benefits for both the owners of organizations and society as a whole.

These economic benefits, in turn, have contributed to a general increase in the affluence, education, and personal level of aspiration of individuals in American society. As a result, people today want jobs that allow them to use their education, that provide "intrinsic" work satisfactions, and that meet their expectations that work should be personally meaningful. No longer will people accept routine and monotonous work as their only legitimate lot in life."⁷

If the above position is indeed valid, then we could conclude that many, if not most, organizations today function in a manner which is in direct conflict with the talents, aspirations and expectations of the employees who work in them. Such conflict could very well result in increased personal alienation from work and decreased organizational effectiveness.⁸

POSITION TWO

On the other hand, there are a number of other academicians and practitioners who take a much different view from that which was discussed by those associated with the first position. The group believes that reports about employee dissatisfaction and discontent, and articles suggesting that employees are demanding more fulfilling jobs have been greatly overemphasized.⁹ They argue that "...the work ethic 'crisis' may be more manufactured than real, ...and probably represents a serious misapprehension of the actual needs and aspirations of people at work."¹⁰

Certainly evidence is available to support the position taken by these experts. In reviewing a number of research studies, one could readily conclude that there is not really any significant work crisis.¹¹

POSITION ONE OR POSITION TWO??

One interesting and very useful way of trying to resolve the conflicting positions taken by the above groups was attempted by J. Richard Hackman.¹² His resolution consists of two complementary conclusions. Each of these conclusions appears to be valid and consistent with existing evidence about the contemporary state and nature of work and workers. However, as Hackman states, the conclusions provide different bases for making decisions about how to design work in the future.¹³

Hackman's First Conclusion:

"Many individuals are presently under-utilized and under-challenged at work numerous jobs have become increasingly simplified and routinized in the last several decades, even as members of the U.S. workforce have become better educated and more ambitious in their expectations about what life will hold for them. The result is a poor fit between large numbers of people and their work. These people have more to offer their employers than those employers seek, and they have personal needs and aspirations that cannot be satisfied by the work that they do."¹⁴

At the same time, however, "It is indisputable that many people do not seek challenge and meaning to their work, but instead aspire to secure jobs and a level of income that permits them to pursue personal interests and satisfactions off the job...."

A major question which Hackman ponders, of course, is what proportion of the work force is comprised of the under-utilized and under-challenged workers. Is it 3/4 of the work force, or only 1/4? Although such data is not available, Hackman states:

"...What we can say - and this statement may be more important - is that for some unknown millions of people work is neither a challenge nor a personally fulfilling part of life. And the organizations that employ them are obtaining only a portion of the contribution that these people could be making."¹⁶

Hackman's Second Conclusion:

"...People are much more adaptable than we often assume. When they must, people show an enormous capacity to adapt to their environments. Through almost whatever happens to them, people survive and make do.....Some of us adjust to challenging, exciting jobs; others of us to a pretty routine and dull state of affairs. But we adapt. Not to do so would open us up to constant feelings of distress and dissatisfaction, noxious states that we are well motivated to avoid."¹⁷

Given his second conclusion, Hackman believes that this adaptability, or plasticity, on the part of people may very well go unrecognized by both sides of the "work crisis" debate.¹⁸ Assuming that most employees do, in fact, adapt to their work environment, Hackman concludes there is a strong risk in taking at face value employees who have considerable tenure. Such self-reports of job satisfaction or lack of job satisfaction do not provide a strong basis for establishing plans for significant changes in organizations.¹⁹

DIRECTIONS FOR THE '80'S

Hackman believes that his conclusions cast substantial doubt on the usefulness of trying to decide whether our country is in the middle of a work "crisis." He takes the position that his conclusions emphasize two quite different directions that could be taken as decisions are made about how to structure, design, and manage work in the future.²⁰

For example, if many workers are, in fact, currently under-utilized and under-challenged by the work they do, then Hackman states that the level of challenge built into their jobs and the degree of control they have in managing their own work should be increased. In effect, according to Hackman, this would mean that an attempt should be made to change jobs to make them better fits for the individuals who do them.²¹

On the other hand, according to Hackman, if most employees gradually adapt and adjust to almost any work situation, even one that initially seems to under-utilize their aptitudes and skills, technological and motivational devices could be used to attempt to change the behavior of workers to fit the demands of well-engineered jobs.²² This position is based on the assumption that in carefully designed work environments, employees would gradually adjust to having little personal control of their work, and the efficiencies gained by utilizing sophisticated managerial controls of work and workers would more than compensate for any temporary dissatisfactions the workers might experience.²³

FITTING JOBS TO PEOPLE

If this direction were to be followed, an attempt would be made to increase the challenge and autonomy of work for employees by creating job conditions that would motivate these employees internally.²⁴ The assumption is that gains would be realized both in terms of productive effectiveness of the organization and personal satisfaction in the well-being of the work force.²⁵

Work would be designed in such a way that employees would experience the work as inherently meaningful, feel personal responsibility for the outcomes of the work, and receive, on a regular basis, valid knowledge and information about the results of their work activities.²⁶

How would jobs be designed to create the conditions stated above? Many experts would recommend the use of job enrichment programs and/or the use of autonomous work teams.²⁷

Job enrichment programs and autonomous work teams have been used with success in a number of organizations. However, more still needs to be learned about how to design, install, and diffuse such innovations more effectively, and about when such strategies do (and do not) result in positive outcomes for workers and for organizations.²⁸

If researchers and practitioners can find answers to the above, then it is fair to say that the nature and shape of work in the '80's could be significantly different from that which exists at the present time.

Assuming that it would be possible to fit jobs to people, Hackman speculates that the design and management of work in the mid 1980's would have some of the following characteristics:²⁹

- (1) Responsibility for work would be at the organizational level at which the work is done. Employees would not experience themselves as people who merely execute activities that "belong" to someone else (for example, the line manager). Instead, they would feel responsible and accountable for their own work. As a result, there would probably be an increase in personal motivation of employees to perform well and also an increase in the quality of work being done.
- (2) Explicit consideration would be given to questions of employee motivation and satisfaction when new technologies and work practices were invented and engineered. Equipment and work systems would not be designed solely to optimize the technological and engineering efficiency and motivational problems left to managers and personnel consultants after the work systems were put in place. In addition, there would be no single right answer about how best to design work and work systems. At times, a task might be arranged to be performed by individuals working more or less alone; at other times, it might be designed to be performed by interacting teams of employees.
- (3) Organizations would have fewer hierarchical levels and fewer managerial and staff personnel whose jobs are primarily documentation, supervision, and inspection of work done by others. A new way of managing employees'

work would be needed. The most challenging managerial problem would be what to do next to keep the employees challenged and interested in their work.

FITTING PEOPLE TO JOBS

What would the structure, design, and management of work in the 1980's look like if an attempt was made to fit people to jobs, as compared to fitting jobs to people? Such a direction would involve designing and engineering work for maximum economic and technological efficiency and then doing whatever had to be done to help employees adapt and adjust in personally acceptable ways to their work experience.³⁰

If this direction was, in fact, taken, Hackman believes that the following characteristics would be present:³¹ (a) work would be designed and managed in such a way that the needs and goals of workers would be subordinate to the demands and requirements of fixed jobs; (b) external controls would be used for making sure that workers would behave appropriately on the job. Such controls would include close and direct supervision, financial incentives for correct performance, tasks that were engineered to minimize the possibility of human mistakes, and information and control systems that would allow management to monitor the performance of the work system closely and continuously; and (c) productivity and efficiency would dominate quality and service as the primary criteria for assessing organizational performance.

Given this direction, Hackman predicts that the design and management of work in the '80's would be as follows:³²

- (1) Technological and engineering considerations would dominate decision making about the design of jobs. Technology is becoming increasingly central to many work activities, and that trend would increase. Such developments would greatly raise the production level of workers and, in many instances, result in tasks that would be arranged in such a fashion as to virtually eliminate the possibility of error because of faulty judgement, lapses of attention, or misdirected motivation.

- (2) There would also be an increase in the capability of industrial psychologists to analyze and specify in advance the knowledge and skills that would be needed for workers to perform almost any task that could be designed satisfactorily. Sophisticated employee assessment and placement procedures would be used to select workers and assign them to tasks. Rarely would an individual be placed in a job for which he or she would not be fully qualified. Such developments would lead to significant improvements in the efficiency of most work systems, and while employees would probably receive more pay for less work, they would also experience substantially less discretion and challenge in their work activities.
- (3) Work performance and organizational productivity would be closely monitored and controlled by managers using highly sophisticated information systems. Integrated circuit microprocessors would provide the hardware to gather and summarize performance data for work processes that at the present time defy cost-efficient measurement. Software would be developed to provide managers with work performance data and costs data that would be far more reliable, more valid, and more current than is possible with current information systems. Managers would increasingly rely on these data for decision making and would use them to control production processes vigorously and continuously. Because managerial control of work would increase significantly, responsibility for work outcomes would be directed in the laps of managers, and the gap between those who do the work and those who control it would grow. There would be an accelerated movement toward a two-class society of people who work in organizations, with the challenge and intrinsic interests of managerial and professional jobs increasing, while the work of the rank and file employees would become more controlled and less involving.
- (4) Desired on-the-job behavior would be elicited and maintained by extensive and sophisticated use of extrinsic rewards. There would be little question about what each employee should (or should not) do on the job. In addition, management would have data readily at hand to monitor the results of each employee's work on a more or less continuous basis. All that would be required then, would be devices to insure that the worker actually does what he or she is supposed to do. Because many jobs would be routinized, standardized, and closely controlled by management, it would be doubtful that employee motivation to perform appropriately could be created and maintained from intrinsic rewards. Management would have to use extrinsic rewards to motivate employees, providing such rewards for behavior that would conform to the expectations of management. Behavioral modification programs - as advocated by B.F. Skinner and adapted from

the principle of contingent rewards - would be among the standard motivational techniques used in organizations.

- (5) Most organizations would need to sponsor programs to aid employees in adapting to life at work. Such programs would include: (a) systematic "attitude development" programs to foster high job satisfaction and organization commitment; and (b) sophisticated procedures for helping employees and their families deal with alcohol, drug abuse and domestic problems. Such programs would become more necessary because of the dysfunctional aspects of designing work and managing organizations dominated by technological and engineering considerations.

CONCLUSIONS

Well, what will the nature of work life really be in the '80's? How will work be structured, designed, and managed? Hackman believes, and I concur, that the movement will be more in the direction of fitting people to jobs, instead of fitting jobs to people, for a number of reasons:³³

- (1) We already know how to operate according to this direction. When it comes to fitting jobs to people, there is less clarity and preciseness.³⁴ Current theory on how best to design enriched jobs and autonomous work groups is still rather primitive.³⁵
- (2) Procedures today for assessing the economic cost and benefits of innovative work designs and for reconciling the dual criteria of efficiency and quality of work life in designing work systems are just beginning to take place.³⁶
- (3) There are few trained groups of managers and behavioral scientists who are jointly working together to create innovative work systems.³⁷ Although the number of case studies illustrating successful work redesign projects has increased,³⁸ it does not appear, at least according to Hackman, that there is any real systematic knowledge about how to proceed with such work design activities that have emerged from such studies.³⁹
- (4) There are few situations where even highly successful programs have been diffused throughout the larger organization in which they were developed - let alone from organization to organization - with the same success.⁴⁰

However, even if we did know more about fitting jobs to people than we currently know, would that really be the direction which we would take in the future!? Hackman certainly is not sure that it would be, and he presents some excellent reasons: (1) Such solutions would require major changes in how organizations are designed and managed. Fitting people to jobs, however, requires solutions which fit well with traditional hierarchical organizational models and current managerial practices;⁴² (2) Fitting jobs to people relies heavily on behavioral science knowledge, methods, and techniques, whereas fitting people to jobs relies more on "hard" engineering technology and traditional economic models associated with organizational efficiency. Hackman asks: "Do any of you know of any situation where behavioral science has ever won out over an amalgam of engineering and economics?"⁴³; (3) The kinds of organizational changes which would be required in terms of fitting jobs to people would most likely reduce many of the more interesting dimensions of managerial jobs in favor of enriching rank and file jobs.⁴⁴ As Hackman points out, "...Given who makes the choices about how organizations are to be run, it doesn't seem to be much of a contest;"⁴⁵ (4) Solutions related to fitting people to jobs may be more consistent with the behavioral styles and values systems of both employees and managers in present day organizations.⁴⁶ Hackman states: "...experienced employees know how to adapt and survive in relatively routine, unchallenging jobs. Would these people, most of whom are comfortable and secure in their work lives, leap at the chance for a wholly different kind of work experience? Some would, to be sure,

especially some of the younger and more adventurous members of the work force; but....many would not! it is unclear how many would be willing to tolerate the upset and the anxiety of the changing process....;"⁴⁷ and (5) Top executives, middle managers and first line supervisors may also not be very enthused.⁴⁸

As Hackman puts it:

"...The whole idea flies into the face of beliefs and values about people and organizations that have become very well learned and well accepted by managers of traditional organizations. Among those beliefs are that organizations are supposed to be run from the top down, not from the bottom up; that many employees have neither the competence nor the commitment to take real responsibility for carrying out the work of the organization on their own; that organizational effectiveness should be measured primarily, if not exclusively, in terms of the economic efficiency of the enterprise; and that more management control of employee behavior is better management."⁴⁹

Is Hackman being too pessimistic? Perhaps he is! There certainly are cases where both employees and managers have responded in a highly positive way to work redesign projects,⁵⁰ and there is evidence of some very interesting job design alternatives.⁵¹ However, as Hackman indicates, many organizations may have progressed so far in the other direction - fitting people to jobs - that it may be too late for them to turn back, at least as they enter the '80's. Perhaps the '90's will be different!

FOOTNOTES

- 1 Many of the ideas presented in this paper derive from "The Design of Work in the 1980's", an essay prepared by J. Richard Hackman for the Visiting Scholars Program of the College of Business Administration, University of Houston. The essay has been published in Organizational Dynamics, Summer 1978, pp. 3-17.
- 2 Ibid., p. 3.
- 3 Ibid.
- 4 Ibid., p. 4.
- 5 Ibid.
- 6 Ibid.
- 7 Ibid.
- 8 Ibid.
- 9 Ibid.
- 10 Ibid.
- 11 For example (see: Hackman, Ibid., pp 1-5) the Ford Foundation sponsored a project to test how satisfied automobile employees in the United States would be working on highly "enriched" team assembly jobs in a Swedish automobile plant. Six auto workers from the United States spent a month working as engine assemblers in a Saab plant in Sweden. At the end of the month, five of the six workers indicated that they preferred the traditional United States assembly line. Authur Weinberg, summarized their reactions:

"...They felt it was a deprivation of their freedom and it was a more burdensome task which required more effort which was more tedious and stressful. They preferred the freedom the assembly line allowed them, the ability to think their own thoughts, to talk to other workers, sing or dance on the assembly line, which you can't do at Saab. There is a freedom allowed on the assembly line not possible in more complex work. The simplified task allows a different kind of freedom. The American workers generally reacted negatively to doing more than one task. They were not accustomed to it and they didn't like it."

In addition a variety of other studies (see: Hackman, Ibid., p. 5) introduce serious doubt that employees who work on routine and repetitive tasks invariably experience psychological and emotional stress as a consequence. For example, a study done by Robert P. Quinn, Graham L. Staines, and Margaret R. McCollough (Job Satisfaction: Is There a Trend?, a 1974 Department of Labor monograph) examined findings from national job satisfaction surveys from 1958 to 1973 and found no decline in job satisfaction over the past two decades. Their conclusion was that the present level of employee job satisfaction is, as it has been in the past, quite high: better than 80% of the employees consistently reported being "satisfied" with their jobs.

12 Ibid., pp. 5-7.

13 Ibid., p. 5.

14 Ibid.

15 Ibid., pp. 5-6.

16 Ibid., p. 6.

17 Ibid.

18 Hackman states: "...Part of the reason is that it is very hard to see adaptation taking place, except when the environment changes dramatically and suddenly. When change is gradual, as it is when a young person adjusts to his or her job, it can be almost invisible. We tend, in our studies of work and workers, to catch people after they have adapted to their work situation or before they have done so rather than right in the middle of the adaptation. It is tough to figure out what is happening (or has happened) to a person at work if you look only once." (Ibid., p. 6).

19 Ibid., pp. 6-7.

20 Ibid., p. 7.

21 Ibid., pp. 7-8.

22 Ibid., p. 8.

23 Ibid.

24 Ibid.

25 Ibid.

- 26 Ibid.
- 27 Many "job enrichment" experiments have been conducted in a variety of organizations over recent years. Such experiments involve alternatives, not only in the task itself, but also in many other aspects of the work organization. However, the focus is clearly on the work done by individual workers. (Hackman, Ibid., p. 9) Another approach is to design work so that it can be done by a more or less autonomous group of workers. The use of a work group as a design device require that attention be given to both the technical and social aspects of the work system. At times, the work group may be the only feasible design alternative for creating a whole and meaningful piece of work. (Hackman, Ibid., p. 9).
- 28 Ibid., p. 10. Also, see: Raymond A. Katzell and Daniel Yankelovich, with Mitchell Fein, Oscar A. Ornati, and Abraham Nash, "Improving Productivity and Job Satisfaction." Organizational Dynamics, Summer 1975, p. 74.
- 29 Hackman, op. cit., pp. 10-11.
- 30 Ibid., p. 11.
- 31 Ibid., pp. 11-12.
- 32 Ibid., pp. 12-13.
- 33 Ibid., p. 15.
- 34 Ibid. For example, Katzell and Yankelovich suggest that job redesign programs are not by any means a sure-fire road to improving both job satisfaction and productivity. They found examples in which job redesign improved workers' attitudes but not productivity, both attitudes and productivity, and neither attitudes nor productivity. (Katzell and Yankelovich, op. cit., p. 74).
- 35 Hackman, op. cit., p. 15.
- 36 Ibid. Lupton's work, however, does seem to be quite encouraging. See: Tom Lupton, "Efficiency and the Quality of Worklife: The Technology of Reconciliation", Organizational Dynamics, Autumn 1975, pp. 68-80.
- 37 Hackman, op. cit., p. 15. For one interesting example, however, of where engineers and social scientists cooperated on an innovative project, see: Lupton, op. cit., pp. 68-80.

- 38 For examples, see: Edward M. Glaser, Productivity Gains Through Worklife Improvements, Harcourt Brace Jovanovich. New York and London, 1976.
- 39 Hackman, op. cit., pp. 15-16.
- 40 Ibid., p. 15. For more insight into this problem, see: Richard E. Walton, "The Diffusion of New Work Structures: Explaining Why Success Didn't Take," Organizational Dynamics, Winter 1975, pp. 3-22.
- 41 Hackman, op. cit., p. 16.
- 42 Ibid.
- 43 Ibid.
- 44 Ibid.
- 45 Ibid.
- 46 Ibid., p. 16.
- 47 Ibid.
- 48 Ibid. For example, William F. Dowling points out that in a 1970 Ford Foundation report, none of the corporate executives interviewed "...really believe that assembly line tasks can be significantly restructured," and "...no one really believes that much can be done to make the assembly jobs more attractive." See: William F. Dowling, "Job Redesign on the Assembly Line, Organizational Dynamics: Management Strategies for Improving Productivity, edited by William F. Dowling, AMACOM, 1975, p. 53.
- Also, there is some evidence which suggests that many supervisors might experience difficulties. See: Richard E. Walton and Leonard A. Schlesinger, "Do Supervisor's Thrive in Participative Work Systems?", Organizational Dynamics, Winter 1979, pp. 25-38.
- 49 Hackman, op. cit., p. 16.
- 50 Ibid.
- 51 See, for example, Edward E. Lawler III, "For a More Effective Organization - Match the Job to the Man", Organizational Dynamics, Summer 1974, pp. 19-29. Of special interest are the Motorola and Non-Linear Systems approaches.
- 52 Hackman, op. cit., p. 17.

SUMMARY

R. L. RINEHART

Based upon conversations throughout the workshop and a number of unsolicited comments, it is evident that the common general reaction is that the individual presentations were very substantive and "full of meat." Therefore, it is not likely to be helpful or appropriate to think of summarizing all of the information into a short statement. The presentations included in this publication are edited and digested as much as is possible. Any further digestion will omit essential information. It is possible, however, to show how this participant related the several presentations and to list his own conclusions. These comments also include an effort to relate some of the shorter topics and the discussions which are not included in the preceding pages. The observations are:

1. Dr. Levitan's "Doubtful Link Between Productivity and Education" involved the fact that some segments of the labor force do not have the experience that might have been evident if we were not pursuing other desirable goals. Coupling this with Dr. Johnson's observations, it seems likely that management will find ways of helping these individuals succeed. These ways are likely to include in-service training as well as the greater competence in management. A significant portion of such training could well be provided by community colleges if the necessary relationships with industry are developed.

2. There very definitely are opportunity fields for individuals now and such opportunities for satisfying careers will continue. The extensive descriptions provided by Donald Sanders and Mary Pat Pennell illustrate this. Again, however, it is essential for industry/business and education to work together carefully because there are many misconceptions and myths regarding such opportunities. The energy situation for example, may well be much more important for management skills than it is for assumed occupations relating directly to energy production. Economic realities may well lead to a greater use of labor resources in many applications instead of the past trend of using energy to reduce labor resources. This possibility may result in a greater use of unskilled labor instead of the conventional assumptions. A reference was made to the National Energy, Education, usiness, and Labor Conference of January, 1979. Their report elaborates on this theme.
3. The audience was a combination of community college presidents with their staff, and corporate executives dealing with manpower planning and human resources development. Questions and comments following Dr. Wilsons presentation made it evident that the corporate executives were not aware of the extent of occupational

education and particularly career education, (meaning the assistance to people in planning careers), in the two-year colleges. At the same time, the college representatives were not aware of the extent of training and development work being done by industry and business. This was noted in the session on computer science and technology.

4. Rapid developments in mini-computers and micro-processors will have a significant effect on the work of many conventional fields in the 80's. These include, law, accounting, business administration, and design as well as those occupations that we normally associate with computing. These developments affect the kinds of work and the types of decisions on problem solving. This in turn should have a major impact on the curricula for such fields.

This example, as reported on at the conference, is part of a larger trend involving technological advances. The U.S. Office of Education, The American Society for Training & Development (Business/Industry), the Presidents Academy of the American Association of Community/Junior Colleges, and the Council for Occupational Education, are jointly studying the topic of "Technology Assessment and Occupational Education in the Future."

5. While this limited workshop chose to concentrate on economic and technological factors, it was recognized that social, legal, and political factors will also affect careers. The presentation regarding health-related careers defined several such forces and influences.
6. Finally, referring back to Dr. Nystroms questions, the keynote address and Dr. Millers thorough analysis, a fundamental forecast is that overall productivity will improve somewhat because of the growing experience of new groups in the labor market. Barring war or other radical developments, the several factors relating to gross productivity (that were described by Dr. Levitan), are likely to overcome the countervailing energy influences and further implementation of social goals. This moderate improvement will make it more possible to support the needed specialized and direct training needs.

PATTERNS CONFERENCE PARTICIPANTS - May 10 & 11, 1979

Edgar Anderson, Cummins Engine Company, Inc., Lakewood, NY 14750
Raymond Anderson, Computer Consoles, Inc., 97 Humboldt Street, Rochester, NY 14609
John Birkholz, President, Erie Community College, Buffalo, NY 14221
Richard Black, Manager, Peat, Marwick & Mitchell & Co., One Marine Midland Plaza,
Rochester, NY 14614
Donald Bronsard, Corning Community College, Corning, NY 14830
David Catlin, Case Hoyt/Rochester, Box 259, Rochester, NY 14601
Robert Chapman, President, Middlesex Community College, Middletown, CT 06457
Jonas Chenault, Wayne County Community College, 4612 Woodward Avenue, Detroit, MI 48201
Joan Claar, Genesee Community College, Batavia, NY 14020
Donald Clark, National Association for Industry/Education Cooperation, 235 Hendricks Boulevard,
Buffalo, NY 14226
Francis Day, Kodak Apparatus Division, Eastman Kodak Company, Rochester, NY 14650
Louis DiFabio, Xerox, 800 Phillips Road, Webster, NY 14580
Louis DiLorenzo, Niagara County Community College, Sanborn, NY 14132
William Dowd, Placement Director, Erie Community College, Buffalo, NY 14221
Douglas Eadie, District Administrative Service, Cuyahoga Community College, 700 Carnegie Avenue
Cleveland, OH 44115
Richard Eaton, Itek Corporation, 811 Jefferson Road, P.O. Box 1970, Rochester, NY 14692
Robert Frank, Rochester Gas & Electric Corporation, 89 East Avenue, Rochester, NY 14649
Lawrence Franchetti, E. I. DuPont DeNemours & Company, Inc., Photo Products Department/
Rochester Plant, Rochester, NY 14603
Gerald Glose, Villa Maria College, Buffalo, NY 14225
Virginia Gonzalez, Northampton County Area Community College, 3835 Green Pond Road,
Bethlehem, PA 18017
Lewis Harriman, Jr., Vice President, Manufacturers & Traders Trust Company, One M & T Plaza,
Buffalo, NY 14240
Joseph Hicks, Lawyers Co-operative Publishing Company, Aqueduct Building, Rochester, NY 14603
John Hostutler, Industrial Management Council, 12 Mortimer Street, Rochester, NY 14604
Howard Jaquich, Vice President of Engineering, Taylor Instrument Company, 95 Ames Street,
Rochester, NY 14611
Lewis Jackson, Vice President for Administration, Sinclair Community College, Dayton, Ohio
45402
Ray Johns, Hagerstown Junior College, 751 Robinwood Drive, Hagerstown, MD 21740
Richard Johnson, Personnel Resources, Eastman Kodak Company, 343 State Street, Rochester, NY
14650

-2- PATTERNS CONFERENCE PARTICIPANTS - May 10 & 11, 1979

Atlee Kepler, President, Hagerstown Junior College, 751 Robinwood Drive, Hagerstown, MD 21740
Michael Kudravetz, Central New England College, Worcester, MA 01610
James Lorion, Cuyahoga Community College District, Cleveland, OH 44115
Richard Lowe, Middlesex County College, Woodbridge Avenue, Route #514, Edison, NJ 08817
Barbara Mahone, Rochester Products Division of General Motors Corporation, 1000 Lexington Avenue, Rochester, NY 14603
John McConkey, President, Lackawanna Junior College, Linden Street at Jefferson Avenue, Scranton, PA 18503
Elizabeth McFadden, Northampton County Area Community College, 3835 Green Pond Road, Bethlehem, PA 18017
Joseph McManus, General Railway Signal Company, 801 West Avenue, Rochester, NY 14611
Thomas B. McMullen, Senior Staff Specialist, Xerox, Bldg. 102, Webster, NY 14580
Charles Meder, President, Community College of the Finger Lakes, Canandaigua, NY 14424
~~Donald Murray, Director of Personnel, RF Communications Division of Harris Corporation, 1680 University Avenue, Rochester, NY 14610~~
Thomas O'Connor, Central New England College, Worcester, MA 01610
James Odom, Jr., President, Harrisburg Area Community College, 3300 Cameron Street Road, Harrisburg, PA 17110
Herman Pollack, Professor, Orange County Community College, Middletown, NY 10940
Christopher Reaske, Dean, Junior College of Albany - Division of Russell Sage College, 140 New Scotland Avenue, Albany, NY 12208
Charles Rollins, President, Bucks County Community College, Newtown, PA 18940
M. Richard Rose, President, Rochester Institute of Technology, Rochester, NY 14623
F. Brooks Sanders, Broome Community College, P.O. Box 1017, Binghamton, NY 13902
Stephen Saunier, Rochester Products Division of General Motors Corporation, 1000 Lexington Avenue, Rochester, NY 14603
Theodore Stebbins, Kodak Park Division, Eastman Kodak Company, Rochester, NY 14650
Stuart Steiner, Genesee Community College, Batavia, NY 14020
Toby Sutton, Greenfield Community College, Greenfield, MA 01301
Thomas TenHoeve, Jr., President, Butler County Community College, Butler, PA 16001
Rowan A. Wakefield, President, Wakefield-Washington Associates, Inc., 1129 20th Street, N.W., Washington, D.C. 20036
Dale Whittington, Economics Planning & Forecasting, Eastman Kodak Company, 343 State Street, Rochester, NY 14650
~~Wendell Bodden, Grumman Aerospace Corporation, Bethpage, NY 11714~~
William Feddersen, President, The Williamsport Area Community College, 1005 West Third Street, Williamsport, PA 17701
~~Allen Gilberti, Niagara Mohawk Power Corporation, 300 Erie Boulevard West, Syracuse, NY 13202~~

PATTERNS CONFERENCE - RIT PARTICIPANTS - May 10 & 11, 1979

John Ballard, Director, Criminal Justice Department, Rochester Institute of Technology
Rochester, NY 14623

William Hinkle, Assistant Dean & Director of NTID Division of Technical & Professional Education, NTID, Rochester Institute of Technology, Rochester, NY 14623

Carol Johnson, Assistant to the Director, School of Printing, Rochester Institute of Technology, Rochester, NY 14623

Donna McDonough, Assistant to the Dean, Rochester Institute of Technology, Rochester, NY 14623

M. Richard Rose, President, Rochester Institute of Technology, Rochester, NY 14623

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